

Appendix 1

Search strategies for Medline and Embase

: MEDLINE <1946 to Present incl: Epub Ahead of Print, In-Process & Other Non-Indexed Citations, and MEDLINE Daily>

Search Strategy:

- 1 Dental Caries/ (40252)
- 2 Tooth Demineralization/ (1901)
- 3 ((dental adj3 decay) or caries).ti,ab. (35840)
- 4 ((dental adj3 decay) or caries).kf. (4714)
- 5 (t??th adj3 deminerali?ation).ti,ab. (257)
- 6 (t??th adj3 deminerali?ation).kf. (27)
- 7 or/1-6 (52510)
- 8 (secondar* or recurrent).ti,ab. (748787)
- 9 (secondar* or recurrent).kf. (8342)
- 10 Dental Restoration, Permanent/ (19031)
- 11 restorat*.ti,ab. (103340)
- 12 restorat*.kf. (1500)
- 13 Composite Resins/ or Dental Amalgam/ (27475)
- 14 (composite or resin or amalgam or (glass adj3 ionomer)).ti,ab. (143835)
- 15 (composite or resin or amalgam or (glass adj3 ionomer)).kf. (4403)
- 16 or/8-15 (982097)
- 17 7 and 16 (9762)
- 18 (in adj2 situ).ti,ab. (230122)
- 19 (in adj2 situ).kf. (3615)
- 20 models, biological/ or disease models, animal/ (568434)
- 21 or/18-20 (793026)
- 22 17 and 21 (170)

Database: Embase <1974 to 2016 September 12>

Search Strategy:

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- 1 dental caries/ (46159)
 - 2 (caries or (dental adj3 decay)).ti,ab. (34847)
 - 3 (caries or (dental adj3 decay)).kw. (5409)
 - 4 or/1-3 (53412) Annotation: caries
 - 5 (secondar* or recurrent).ti,ab. (983062)
 - 6 (secondar* or recurrent).kw. (38298)
 - 7 restorat*.ti,ab. (115235)
 - 8 restorat*.kw. (4515)
 - 9 exp resin/ (60976)
 - 10 (composite or amalgam or resin or (glass adj3 ionomer)).ti,ab. (166265)
 - 11 (composite or amalgam or resin or (glass adj3 ionomer)).kw. (14567)
 - 12 or/5-11 (1268823) Annotation: secondary/restorative material
 - 13 4 and 12 (7993) Annotation: secondary caries
 - 14 (in adj2 situ).ti,ab. (255474)
 - 15 (in adj2 situ).kw. (27757)
 - 16 model/ or exp biological model/ or exp disease model/ or exp experimental model/ (1614396)
 - 17 or/14-16 (1851442) Annotation: (in situ) model
 - 18 13 and 17 (165)

Appendix 2

Risk of bias assessment tool

For questions 1 through 10, write “yes” or “no” for each article.

1. Are volunteers free from dental knowledge?
2. Are patient variables described properly? (age, gender, nationality)
3. Are samples randomly allocated to a group?
4. Rotation of samples
Are samples balanced/rotated in the devices?
5. Were participants blinded to the purpose of the study?
6. Blinding of researcher doing analysis, statistician
Was the researcher doing the substrate analysis oblivious to the group the sample belonged to?
7. Sample size calculation
Was a sample size calculation carried out to determine optimal sample size?
8. Presence of a control group
Was the intervention compared to a control group that is in all other aspects the same?
Location of control samples comparable to location of intervention samples?
9. Cross-effect
Were materials related to the study outcome prevented from contaminating samples outside their own group?
10. Selective outcome reporting
Were all data reported? Dropouts reported well? Was the study carried out for the length of time it was planned? Is there no evidence to suggest that the authors measured more outcomes than they reported?
Note for question 10: If the answer to any of these questions is no, the answer to this entire question should be reported as ‘no’.

Other sources of bias

Are there any other factors in the study that could have led to bias and have not been reported above?

Every “no” is 1 point. Add 1 point for each extra risk identified under “other sources of bias”.

1-3 points: Low risk of bias

4-6 points: Average risk of bias

7 or more points: High risk of bias

Appendix 3

Supplementary table risk of bias scores

This table presents the risk of bias for each of the articles, determined through the risk of bias assessment tool. The number under 'Score' is the amount of points a study received after application of the tool.

First Author	Year	Score	Risk of bias
Barata	2012	5	Average
Benelli	1993	5	Average
Cenci	2008	5	Average
Chimello	2008	2	Low
Chimello	2008	2	Low
Colucci	2015	4	Average
Da Silva	2010	7	High
De Moraes	2016	6	Average
Dijkman	1992	7	High
Hara	2006	4	Average
Jorge	2015	5	Average
Kielbassa	1999	7	High
Kielbassa	2003	7	High
Kuper	2015	6	Average
Kuper	2014	5	Average
Lennon	2007	5	Average
Lima	2009	5	Average
Melo	2014	5	Average
Melo	2013	4	Average
Montagner	2015	5	Average
Moura	2004	6	Average
Paradella	2008	4	Average
Pinto	2015	7	High
Pinto	2009	6	Average
Thomas	2007	4	Average
Van de Sande	2014	2	Low
Vasconcelos	2014	5	Average
Kirsten	2013	6	Average
Reinke	2012	6	Average
Sousa	2009	4	Average
Wang	2010	3	Average